Energy Collaborative Analysis Initiative

2nd Annual Workshop
"Collaborating on Analysis Data and Results"

June 27-28, 2007
Washington, D.C.

Outcomes Document

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Prepared by the National Renewable Energy Laboratory
For the U.S. Department of Energy's
Energy Efficiency and Renewable Energy Office and
The Energy Collaborative Analysis Initiative

Energy Collaborative Analysis Initiative – Workshop Summary

The Office of Energy Efficiency and Renewable Energy (EERE) at the U.S. Department of Energy (DOE), in conjunction with a multi-organizational Leadership Committee, convened the second annual Energy Collaborative Analysis Initiative (ECAI) 2007 workshop (http://www.nrel.gov/analysis/collab_analysis/workshop_0607.html). This workshop assists federal and state officials and research organizations in identifying opportunities to enhance collaboration on energy analysis, helping inform and drive policy making. Such collaboration can make analysis more efficient and cost effective and can increase credibility by improving analytical methods, developing standardized assumptions and methodologies, and producing better results for decision-makers.

This document summarizes the workshop and this section provides an overview of the discussions that occurred during the workshop. The topics that were covered range from in-depth information on quality and availability of data resources, to modeling behavioral factors and portfolio risk analysis. The summary is followed by the agenda and detailed appendices for each session. Each appendix contains detailed notes from the discussions, and a list detailing activities on which participants can collaborate. The speakers and participants are listed for each session as well. For more information, including all speaker presentations and details on both ECAI workshops, please visit http://www.nrel.gov/analysis/collab_analysis/.

The ECAI 2007 workshop drew a large, varied group of participants. Of the 62 analysis collaborators at the workshop, many federal and state organizations were represented. The federal agencies included: U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (DOE-EERE), DOE's Energy Information Administration (DOE-EIA), DOE's Office of Science (DOE-Science), U.S. Department of Defense (DOD), U.S. Environmental Protection Agency (EPA), U.S. Federal Energy Regulatory Commission (FERC) and U.S. Department of Housing and Urban Development (HUD). States and state organizations represented were: California, Colorado, Georgia, Massachusetts, Michigan, New York, and the National Association of State Energy Offices (NASEO). There were representatives from research organizations, including American Council On Renewable Energy (ACORE), American Council for an Energy Efficient Economy (ACEEE), Massachusetts Institute of Technology (MIT), Northeast States for Coordinated Air Use Management (NESCAUM), Rutgers University, the University of Tennessee, and the Western Governor's Association (WGA); and U.S. National Laboratories including Argonne National Laboratory (ANL), National Energy Technology Laboratory (NETL), National Renewable Energy Laboratory (NREL), Oak Ridge National Laboratory (ORNL), and Pacific Northwest National Laboratory (PNNL). For a full list of the participants, please see Appendix 9 or visit http://www.nrel.gov/analysis/collab_analysis/pdfs/2007/workshop_pres/ws07_participants.pdf.

Common Themes

As the workshop progressed, there were a few common themes that emerged and were discussed in at least several (but not necessarily all) sessions. By highlighting these themes here, we hope to identify a number of activities that are critical to coordinating on energy analysis. The common themes include:

- Policies can have a positive impact on the development of successful markets—care should be taken to analyze both the potential positive and negative impacts,
- Human behavior directly drives which technologies are adopted and how quickly—this human element/variable needs to be incorporated more directly into market modeling
- There are many sources of data—it is important to collaborate on identifying publicly available sources of data, clarifying the quality of those sources, and explaining how the data can be used appropriately,
- Data gaps and shortcomings make modeling difficult. Are there accepted methodologies for addressing these gaps in analysis? On a broader basis, are there ways we can work together to address these gaps?
- Policy makers often have difficulty balancing many divergent goals (e.g., some energy and environmental goals may be in conflict). How can ECAI be used to provide decision-makers with tools to balance their goals using appropriate data and analysis?
- Once analysis is performed, how can the results be clearly and concisely communicated to decision-makers?
- Sometimes modeling is used to answer questions and to drive policies and decision-making, while other times the policies are set and analysis is used to justify the decisions. Is there a way for us to work together to help analysis play a more fundamental role?

Workshop Session Overview

Plenary Session: Modeling Aggressive Renewable Energy Goals (e.g. 25% by 2025)

The plenary session gave a general overview of a variety of aggressive energy goals and described the assumptions, analysis methodology, and results from analyses of each goal. This session highlighted the fact that many U.S. states and organizations are developing aggressive renewable energy and fuel mandates and goals. Policies examined by the speakers included state Renewable Portfolio Standards (RPS), proposed federal RPS mandates, and the "25x'25" effort, the goal of which is to provide 25% of our electricity and fuel using renewables by 2025. The four speakers and their presentations covered:

1. Mike Eckhart, American Council on Renewable Energy (ACORE). *"The Outlook on Renewable Energy in America – Joint Summary Report"*
2. Professor Burt English, University of Tennessee. *"Agricultural data and modeling of 25x'25"*
3. Chris Namovicz, U.S. Department of Energy (DOE) – EIA. *"Looking at RPS Policy at 15% and beyond"*
4. Thomas Jenkin, National Renewable Energy Laboratory (NREL). *"Status of Renewable Energy Modeling and Analysis Partnership (REMAP)"*

After each speaker presented the results from their analysis of energy policies, a broader discussion was conducted about the technical challenges for modeling such high penetration levels in conventional energy models. For example, analysts described situations where they incorporated aggressive goals into their model, which provided impossible results. The discussion then focused on how to trace the root cause and ways to adjust your model (inputs, methodology, etc.) to deal with these extreme scenarios.

Session A: Improve Behavioral Factors in Market/Choice Models

Breakout session A began with a discussion about research and development (R&D) planning model that would enable policy makers to understand the impacts of investments in basic and

applied research in relationship to the accomplishment of key national energy and environment goals. R&D planning models might address questions such as: would accelerated development of certain classes of materials improve the efficiency of solar cells? Would investments in microbial genomics speed the development of cellulosic biofuels?

Integrated into this discussion was a behavioral modeling philosophy, the end goal being able to demonstrate techniques and results from modeling policy development and assessment by incorporating behavioral factors. Integrated assessment models (IAMs) incorporate information across disciplines and multiple spatial and temporal scales. Integrated assessment models vary widely in their complexity, intended uses, and range of topics covered. When applied to climate change, IAMs often produce estimates of how much climate change is likely to occur in the future, quantification of climate change drivers (e.g., anthropogenic emissions, land-use changes), analysis of mitigation costs, and the identification of technologies and policies that can reduce costs.

Sessions B and F: Energy Model Data Resources

Two sessions were devoted to energy model data resources and both discussed the areas of energy modeling where access to data is currently a limiting factor.

Session B focused on ways to properly characterize technologies (conventional and clean) in models and also discussed data resources available to characterize the electrical transmission grid. The discussion began with technology characterization, data resources, and limitations. Topics covered by the speaker included data issues and shortcomings faced by modelers, data sources, and the theory behind estimating and analyzing economic impacts.

Session F segued into the analysis of renewable energy and petroleum and the data resource modeling issues for both. One of the presentations also focused on petroleum data and methods for analysis of short-term supply, demand, and prices. Other issues discussed were how some models may be more accurate in principal than in reality, and potential improvements and gaps in tools and methodologies.

Session C: Integrated Energy and Environmental Scenarios

Breakout session C discussed the possibilities and challenges associated with integrating energy and environmental scenario modeling. Topics addressed included what the typical types of analyses being performed on both the energy and environmental sides are; what the primary data needs are of energy (or air quality) analysts and planners; and what opportunities exist to interconnect energy and environmental modeling. The discussion focused on the fact that different assumptions and analysis methodologies for energy (efficiency, generation, transmission, and transportation), and environmental modeling (emissions, land use, water use, etc.) can lead to results that cannot be directly correlated because they characterize the two areas so differently.

There was also a broad overview of the challenges and opportunities for incorporating air pollution control regulatory scenarios and data into energy models (or vise versa). One of the main points was to draw attention to issues like variances between national, regional, state, and local data, which are not always compatible. Additionally, one speaker pointed out that energy

models are currently very large and quite slow – and that if environmental impacts/drivers were added into the modeling, the models would become even slower and potentially of not much use.

The speakers discussed these issues with the audience and tried to identify ways that energy and environmental modeling and scenarios could be more closely correlated, and identified that perhaps the data sources and assumptions could be coordinated, even if the models themselves could not be integrated.

Session D: Improve Economic Impact Evaluation Tools and Methodologies
Session D explored how economic impact evaluation methodologies and tools that can be applied to a full range of energy efficiency and renewable energy technologies, projects, and policies were the next focus of the workshop. It addressed key issues regarding modeling and adjusting for inter-regional trade. The idea is that a model may be more accurate in principal; therefore, emphasis was placed on potential improvements and identifying gaps in tools and methodologies.

Session E: Risk and Uncertainty in Energy Modeling
Session E discussed ways to incorporate risk and uncertainty into energy modeling quantitatively, rather than just qualitatively. The discussions were led by professionals working in this area, and focused on providing updates on their work.

The speakers explored the importance of doing risk analysis and different ways how to do risk analysis, so that analysts can help decision-makers incorporate analysis into their decisions. Uncertainty is always an issue, and by incorporating risk analysis quantitatively, analysts are better able to characterize the scenarios they are investigating and the results (e.g. simulation rather than optimization). The speakers discussed systems-based approaches to estimate the technical risk and uncertainty of R&D outputs. They also talked about applying technical and market risk and uncertainty in program and technology benefits estimates. The use of Monte Carlo analysis in MARKAL modeling was discussed as well.

Closing Discussion: Steps to Promote Ongoing Coordination and Communication
The closing discussion looked at activities and ideas for improving analysis coordination and collaboration in the future through improved communication. The session discussed the process for ECAI to provide direct input into the federal analysis agenda at federal agencies using multi-year planning and AOPS. ECAI would be used as a forum to discuss all types of analysis across state and federal agencies, the academic world, and internationally. Developing a process for unbiased peer review in order to share data sources was mentioned, including QA/QC when analysis is developed and when conclusions are formed.

The discussion then turned to how to effectively communicate with decision makers. Several suggestions and approaches were discussed, including: the use of animation, explaining complex material by visual means, and using extraordinary examples to illustrate the fundamental principles of information displays. The importance of understanding the audience (decision-maker) and how he/she processes information was stressed. This understanding helps determine the most important variables, what the audience needs to hear versus what the speaker thinks they want to hear, and what to do in the absence of data.

Appendix 1. Energy Collaborative Analysis Initiative–Workshop Agenda

Day 1 June 27, 2007	***Activities***
8:00 am	Continental Breakfast
8:30 am	Welcome, introductions, initiative and workshop goals, initiative vision
9:30 am – 12:30 pm (Break During Session)	Concurrent breakout sessions (First Grouping)
	Topic #A – **Improve Behavioral Factors in Market/Choice Models and Tools**
	Topic #B – **Energy Model Data Resources I – Technology Characterization and Energy Transmission**
	Topic #C – **Integrated Energy and Environmental Scenarios**
12:30 pm	Lunch
2:00 pm	Present results/follow-up activities for Topics A, B and C
2:45 pm	Break
3:00 pm	Plenary session – **Modeling Aggressive Renewable Energy Goals (e.g. 25% by 2025)**
5:00 pm	Adjourn
Evening	Join together for social dinner, off-site

Day 2 June 28, 2007	***Activities***
8:00 am	Continental Breakfast
8:30 am – 11:30 am (Break During Session)	Concurrent breakout sessions (Second Grouping)
	Topic #D – **Improve Economic Impact Evaluation Tools and Methodologies**
	Topic #E – **Risk and Uncertainty in Energy Modeling**
	Topic #F – **Energy Model Data Resources II – Renewable Energy and Petroleum**
11:30 am	Present results/follow-up activities for Topics D, E and F
Noon	Working lunch to identify additional topics of importance for the initiative
1:30 pm	Wrap-up – improve sharing of info/methods and next steps
2:00 pm	Adjourn

*For the full agenda, please visit http://www.nrel.gov/analysis/collab_analysis/workshop_0607.html.

Appendix 2. Topic A: Improving Behavioral Factors in Market Choice Models and Tools

Participants:

Bill Babiuch
Sam Baldwin
Darrell Beschen
Dave Bjornstad
Brian Card
Ron Diehl
Karen Ehehardt-Martinez
Tom Fiddaman (presenter)
Kohl Gill (presenter)
Rich Halvey
Scott Hassell
John Maples
Lynn McLarty
Gail Mosey (facilitator)
Walter Short
Linda Silverman
Steve Smith (presenter)
Jeroen Struben (presenter)
Bill Valdez (presenter)
Carol B. White

Potential Collaborators:

DOE
EPA
FERC
CEC
NYSERDA
States
DOE-O.SC, Bill Valdez
Dave Bjornstad (self-identified)

Summary:

High priority analysis questions to address during session:

- What is a better analytical way of representing choice?
- How do analysts better investigate and estimate behavioral parameters?
- How can analysts get a better sense of distributions when estimating parameters?
- What assumptions about behavior are implicit in existing modeling approaches?
- How does dynamic decision making intersect with discrete choice?
- What can one conclude about behavior from aggregate economic dynamics that reflect both individual agent choices (deliberate substitution) and agent population dynamics (firm expansion, contraction)
- How do key behavioral assumptions (e.g. (mis)management of depletion rents, optimality (or not) of energy efficiency decisions) influence policy conclusions?
- What are the behavioral challenges in representing R&D management?

Topic 1: R&D Modeling
Speaker 1: Bill Valdez, U.S. Department of Energy (DOE) - Office of Science

An R&D planning model would enable policy makers to understand the impacts of investments in basic and applied research in relationship to the accomplishment of key national energy and environment goals. R&D planning models might address questions such as, would accelerated

development of certain classes of materials improve the efficiency of solar cells? Would investments in microbial genomics speed the development of cellulosic biofuels?

Presentation covers:

- Current state-of-the-art in behavioral factors in R&D modeling, to include a status update on analysis activities since ECAI WS 2006
- Provide views on high priority analysis questions

Topic 2: Policy Development and Assessment
Speaker 2 (Demo): Tom Fiddaman, Ventana Systems

Presentation covers:

- Behavioral modeling philosophy
- Practical implications for managing the basic science portfolio
- Demonstrate techniques and results from modeling policy development and assessment, incorporating behavioral factors
- Provide views on high priority analysis questions above

Topic 3: Integrated Assessment
Speaker 3: Steve Smith, Pacific Northwest National Lab/Joint Global Climate Change Research Institute (PNNL/JGCRI)

Integrated assessment models (IAMs) incorporate information across disciplines and multiple spatial and temporal scales. Integrated assessment models vary widely in their complexity, intended uses, and range of topics covered. When applied to climate change IAMs often produce estimates of how much climate change is likely to occur in the future, quantification of climate change drivers (e.g., anthropogenic emissions, land-use changes), analysis of mitigation costs, and the identification of technologies and policies that can reduce costs.

Presentation covers:

- Current applications and discussion of associated issues faced when conducting an integrated assessment analysis
- Provide views on high priority analysis questions

Synthesis and Wrap-up

Solutions identified in group discussion (and captured on storyboards) will be arranged and the group will lay out steps to take action and identify potential collaboration.

Q&A:

1. Presenter Tom Fiddaman
    - Word of mouth
        - More or less
        - Data to support
    - Human nature or external factors

    - Long term transition dynamics
    - Certain characteristics are captured. Exceptions would need to be addressed separately
    - Consider the average consumer
- Feedback on fuel availability
    - Urban/rural
    - Infrastructure
    - Where along trip is fuel available? Lines?
    - Model retail fuelers and consumer response
- Need policy to help make markets develop?
    - Need to address non-urban areas
    - Fuel taxes
    - Vehicle replacement dynamics
- Heating/lighting/transportation
    - Modeling applications
- Potential for drawing on real world data
- Midwest-blue skyways collaboration EPA
- Policy
    - Tax incentives
    - Financial incentive
    - Come into model

2. Presenter Steve Smith
    - Disruptive Technology
        - Lack some data
        - Can speculate (e.g., plug in hybrids). Structure of model is flexible
        - More technology options
    - CCTP Scenarios
        - Technology and supply electricity at low cost and carbon free
            - Impacts
    - Demand linked price
        - Price indifference–coal industry
        - Have coal plants already paid for and run as long as cover capital costs
    - Early Adopters
        - Tails not well defined
        - Log it is not well suited
    - Cost and Quality
        - Embedded in history calibration
        - Doesn’t capture it all at equilibrium
        - On tail or where in distribution
    - Consumer behavior and choice influence by marketing
        - What is the impact on modeling?
    - Need to identify factors that people value.
        - Need to better understand these factors.
    - There is a difficulty in selling models and results to models if inputs seem subjective.
    - Convince citizens that this is their contribution.

    - Example of “Smokey Bear” for RE/EE
        - Protecting the environment.
- Need to make EE/RE technologies the market choice.
    - Can push, but consumer demand is a powerful force.
- How do we represent in methodological terms a way that won’t make us puke?
- BldgAM, BeOpt., etc., are model examples
    - Have to work through the processes
    - Need consistency
    - Technology change leads to adoption/interest leads to modification of industry standards
- Value of model–command and control strategy.
    - Trying to get consumers to change is another matter. Cannot mandate expensive EE.
- Need a better handle on deployment.
- Weighting of choices?
    - More expensive vs. least expensive
- Several factors to consider
    - Architecturally need to design an EE space that is very livable
    - Waste associated with building. If builder buys material themselves it cuts down on waste
    - Low cost no cost, small ways to improve EE, reduce consumption by 10% and simple fixes
    - Systematize the above changes

Summary Discussion

- Reconstruct data (lighting use).
- What are factors that lead to behavior changes?
    - Look at past U.S. and international trends
- Defacto–Solve problems through technologies.
    - Not considering behavior changes.
- Goals set through policy.
- Have effective economic models.
    - Try to expand the economic paradigm
- Modeling is a process of thinking things through.
- We need to model intelligently.
- There is hesitancy on the technology side.
    - Where is the decision point in the technology community?
- Incorporate a bottom-up penetration strategy

Key Gaps Identified During Session

A. Fitting models to disruptive times, beyond BAU.

- Identify factors that lead to behavioral changes.
- Look at the past–U.S. and international.

- Adoption of new technology.
- Defacto has been solving problems through technology, not considering behavior.

B. Move beyond economic impact and to expand traditional econometric modeling.
- Conjoint analysis?
- What do people value?

C. Energy services versus energy technology.
- What are people trying to get done?
- Lots of options and ways we can change.

D. Data gathering
- Quality data
- Historical–we're generating future data without much past data
- Determine estimates needed and reconstruct from data available (lighting use for instance)
- Set up to start capturing data and shorten the lag
- Look outside traditional sources.
- Tap into the innovative consumer
- Results
    - Present online
    - Have evaluative feed back
    - Reduce technology transfer time (blogs and media outlets)

Activities/Collaborators/Next Steps (When Identified) Summarized

A. Historical data
- Determine estimates needed and reconstruct from data available
    - I.e., lighting use
- Potential collaborators
    - DOE
    - EPA
    - FERC
    - CEC
    - NYSERDA
    - States
- Next steps
    - At next IWG meeting, examine concept and practicalities of data gathering taking into account minimum data requirements, uncertainty in data gathering, and a stopping point.

B. Fit models to disruptive times, beyond BAU
- Identify factors that lead to behavior changes.
- Look at past, US and internationally, adoption of technologies.
    - DeFacto has been solving problems through technology and not consider behavior.

C. Move beyond economic impact and to expand traditional econometric modeling.
- Energy services versus energy technology.
    - What are people trying to get done?
- Lots of options and ways we can change

D. Figure out what program evaluation and assessment could be suspended for 12-18 months to assess needs and gather data
E. Continue progress in modeling behavioral factors
    - Potential collaborators
        - DOE-O.Sc. (Bill Valdez)
    - Next steps
        - NSF interest
        - DOE-O.Sc. is sponsoring model building
        - OSTP working group

Appendix 3. Topic B: Energy Model Data Session I: Technology Characterization and Energy Transmission

Participants :

Cyrus Bhedwar	Brian Levite	Eric Smith
Phil Dipietro	Chris Namovicz	Uday Varadarajan
Kohl Gill	Phil Patterson	Dave Vidaver
Susan Holte	Dan Santini	
Michael Leifman	Elaine Sision-Lebrilla	

Summary:

This session will involve discussions of areas of energy modeling where access to data is a currently a limiting factor. Each presentation will be followed by a facilitated discussion of challenges and potential avenues for improvement.

Topic 1: Modeling Data Issues in the Area of Technology Characterization
Speaker 1: Susan Holte, U.S. Department of Energy (DOE) – EIA.

Presentation covers:

- Technology characterization data resources and limitations.

Topic 2: Collaborative for University Research on Energy Data (CURED)
Speaker 2: Michael Leifman, U.S. Department of Energy (DOE) – EERE/PAE

Presentation covers:

- Group discussion of modeling data issues in the area of electricity transmission.

Topic 3: Electricity Transmission Data resources and Limitations
Speaker 3: Dave Vidaver, California Energy Commission (CEC).

Presentation covers:

- Data issues/shortcomings faced by modelers
- Data sources

Synthesis and Wrap-Up

Technology Characterization:

1. Data resource issues
    - Data in NEMS model
    - DOT vehicle inventory and use survey are no longer funded.
    - DOT vehicle household travel survey is no longer funded.
    - EIA has not published new data on alternative fuels and vehicles in the last two years.

- Stricter regulations by R.L. Polk mean the latest number of vehicles by age that we can publish is 2001.
- American Metals Market discontinued the survey which collected info on the average materials in a domestic car–2003 last available.
- Market sensitive data is not always available.
- Efficiency data is often hard to find or unclear.

2. Using the information
    - Congress is a major user of NEMS data
    - Lack of clarity on the role of energy modeling
3. Gaps and shortcomings
    - Are transport modules in energy models robust/accurate enough?
    - Lack of transmission model in NEMS.
    - Short-term price elasticity is not available.
    - There are some elements in models that are simply unknown.
    - Future estimations include varying amounts of risk/uncertainty.
4. Application issues
    - Technology choices in modeling.
    - NEMS is slow
        - Takes one day to run
    - Aggregation into technology clusters.
    - Level of optimism.
    - Consistency of various data sources in models.
    - Long-term trends versus short-term adjustments.
    - Learning effects.
5. Potential solutions
    - Study the value of data sources being discontinued.
    - What improvements could be made in renewed studies?
    - Evaluate new data needs through sensitivity analysis.
    - Step back from models used to predict the future.
        - Accept uncertainty as a major limitation.
    - Group of platform to speak publicly about energy modeling issues.
    - Create a central inventory of model data resources.
    - Collaborative for university research on energy data.

Transmission

1. Data resource issues
    - Lack of reporting requirements for control area operations.
    - There are many CAOs, making access to data inconsistent.
    - (Dis)aggregation of TTCs is not straightforward.
    - Balkanization of grid–limited need for data.
    - Transmission outage rates are only available through the ISO.
    - Lack of collection efforts from coordinating councils.
    - Transmission needs are easier to determine than transmission costs.

2. Using the information
    - Very few people outside utilities use this data, making it harder to get.
    - Because of deregulation, more data is held as market sensitive.
    - National security concerns.
        - More data elements are held as confidential.
    - Accessing data through legal steps creates an adversarial situation.
    - Can modeling help us determine what kind of transmission to build?
    - Transmission costs estimates have a major impact on the evaluation of distributed energy costs.
3. Gaps and shortcomings
    - Vendors may be slow to incorporate upgrades into their databases.
    - In the hybrid market, only ISO collects data on entitlement shares when traded or auctioned.
    - Changing the cost of transmission upgrades makes even recent estimates invalid.
    - Cost estimations for transmission differ substantially based on the region.
4. Application issues
    - CA ISO data is very difficult to use.
5. Potential solutions
    - Develop data reporting requirements for RTOs.
    - Creating aggregated data would give RTOs and CAOs a level of anonymity.
    - RTOs provide better data than traditional CAOs.
    - Annual reports of RTOs are good sources of aggregate data and statistics.
6. Actions
    - FERC rulemaking.
    - Independent third party.

Activities:

Activity #1: Create a renewable energy data needs inventory and engage ACORE and Agencies

Participants:

- Dwayne Breger, MA DOER
- Steve Smith, PNNL
- Chris Namovicz, EIA

Activity #2: Explore concept of a Collaborative for University research on energy data

Participants:

- Phil Patterson, DOE–EERE
- Cyrus Bhedwar, GA EFA
- Dan Santini, ANL
- Mike Lahr, Rutgers

Activity #3: Create an inventory of Energy modeling data sources

Participants:

- None

Activity #4: Identify current transmission data reporting requirements and make recommendations on addressing gaps

Participants:

- None

Activity #5: Fossil Fuel Data collection

Participants:

- None

Specific activities include:

- Determine EIA plans
- State practices
- Legislative needs
- Industry data resources

Appendix 4. Topic C: Integrated Energy and Environmental Scenarios

Participants:

Misha Adamantiades	Sujit Das	Rich Mignogna
Ron Benioff	Burton English	Denise Mulholland
Cary Bloyd	Gary Kleiman	Michelle New
Dwayne Breger	Michael Leifman	Tom Secrest
Ed Coe	Dan Loughlin	Uday Varadarajin
Karlynn Cory	Nora Lovrien	Maria Vargas

C. Summary

High priority questions to address during session:

- What are the typical types of analyses being performed on both the energy and environmental sides?
- What are the primary needs that energy (air quality) analysts and planners have for improved data on air pollution (energy) forecasts, scenarios, and data?
- What opportunities exist to interconnect energy and environmental modeling? Energy and environmental planning?
- What are some of the key challenges with data, methods and implementation?
- How can analysis results be presented to decision-makers concisely and in a manner that makes sense to them?

Topic 1: Air Pollution Control Regulatory Scenarios and Data into Energy Models
Speaker 1: Michael Leifman, U.S. Department of Energy (DOE) - EERE

Presentation covers:

- A broad overview of challenges and opportunities for incorporating air pollution control regulatory scenarios and data into energy models.
    - Includes the possibility of calibrating data and analytical methods between the two as well.

Topic 2: Air Quality
Speaker 2: Dan Loughlin, U.S. Environmental Protection Agency (EPA) - Research Triangle Park

Presentation covers:

- How air quality scenarios are currently modeled and their impact on energy futures and the energy system.
- Discuss modeling results from regional MARKAL.

Panel Discussion – Integrated Energy and Environmental Modeling

Key questions:

- What analysis are you doing that links energy-environmental issues?
- What challenges are there in integrating energy-environmental analysis? Planning?
- How are you addressing:
    - National vs. regional vs. state vs. local?
    - Treatment of uncertainty and risks?
    - Multi-pollutant, multi-media, and life cycle analysis?
    - Dealing with trade-offs between environmental and energy options?
- How can analysis results be presented to decision-makers concisely and in a manner that makes sense to them?

Topic 3: State Framework
Speaker 3: Denise Mulholland, U.S. Environmental Protection Agency (EPA)

Presentation covers:

- State framework:
    - Identify models and tools available that link energy and environment
    - Show pathway of how to get from clean energy savings to emissions savings
        - IMPLAN
        - MARKAL

Topic 4: Regional Environmental Analysis
Speaker 4: Gary Kleiman, Northeast States for Coordinated Air Use Management (NESCAUM)

Presentation covers:

- Current methods and tools for regional environmental analysis
    - MARKAL

Topic 5: Perspective on a Regional Initiative
Speaker 5: Dwayne Breger, Massachusetts Division of Energy Resources (MA DOER) and RGGI

Presentation covers:

- A state energy office perspective on a regional initiative for economic impact analysis
    - IPM model
    - REMI model
- Q&A on presentations

Facilitated Discussion with Audience – Integrated Energy and Environmental Modeling

Key questions:

- What is missing and should be addressed?
    - Are there opportunities for collaboration in any of these areas?
- How can analysis results be presented to decision-makers concisely and in a manner that makes sense to them?

Synthesis and Wrap-Up

Analysis Needs:

1. Uncertainty analysis
    - Scenario/sensitivity analysis
    - Error bands on data
2. Shared understanding of available models, tools, and guidance on appropriate uses
    - Validation status
    - Uses, limitations, and availability
    - State and regional level applications
3. Centralized data collection such as a collaboratively funded data center
4. Review products under development and disseminating information on these emerging products
5. Understanding key energy–environmental tradeoffs such as
    - High energy demand
    - Biomass
    - Unintended consequences
6. Compendium of information on environmental regulations and implications for energy
7. Improved understanding of co-benefits methods and tools
    - Integrate with modeling (NESCAUM/EPA)
8. Better information and awareness of benefits of avoiding climate change.
9. Improved scope and access to supply curves for energy/climate mitigation options including existing capital stock.
10. Improved communication of broad externality benefits of energy tech.
11. Improved emission factors.
12. Better information and access to existing information on performance + costs of emerging technologies.
13. Integrated, meta model or framework to identify key uncertainties and direct work.
    - Integrated Environmental impact assessment
    - Understanding unintended consequences
    - Meta analysis of energy and environmental assessments
14. Better communication of energy and environmental interactions to decision makers.
    - Shift debate to key sensitivities/scenarios and probabilities

Voting on Priorities:

Rank	Topic	Votes
1	Communication: Improved communication of broad externality benefits of energy tech; Better communication of energy and environmental interactions to decision makers	14
2	Understanding key energy–environmental tradeoffs	9
3	Supply curves for energy/climate mitigation options	6
4	Guidance on use of models	5
4	Integrated, meta model or framework to identify key uncertainties and direct work	5
6	Centralized data collection	4
6	Information on performance + Costs of emerging technologies	4
8	Benefits of avoiding climate change	1

Integrating Energy and Environmental Analysis – Next Steps:

1. Convene three groups
    - Group 1 -
    - Group 2
    - Group 3
2. Broader recommendation for expanded/continued dialogue on analysis agenda for key DOE and EPA offices (http://www.nrel.gov/analysis/collab_analysis/).
    - Include presenting agendas.
3. Summarize key activities in all 14 areas.
4. Explore in person day long meetings on specific topics hosted by various participants.
5. Webinar on DOE (and other Federal) analysis agenda.

Activities:

Activity #1: Group to define key energy and environmental trade offs that merit further evaluation.

Specific activities include:

- Listing the tradeoffs
- Inventory current studies/information.
- Improved information and framework for analysis

Biomass could be a good starting topic on which to start defining the key energy and environmental trade-offs that merit further evaluation

Participants:

- Cary Bloyd, ANL
- Dwayne Breger, DOER
- Maria Vargas, DOE–FE/NETL
- Paul DeCotis, NYSERDA
- Dan Loughlin, EPA

Activity #2: Better Communication to decision makers on Energy–Env. Interactions

Create an expert group to highlight:

- Key sensitivities
- How to communicate to decision makers
- Provide advice on who should be the decision makers

Participants:

- Michelle New, NASEO
- Maria Vargus, DOE–FE/NETL
- Tom Seacrest, PNNL

- Nora Lovrien, Rutgers
- Gary Kleiman, NESCAUM
- Paul DeCotis, NYSERDA
- Denise Mulholland, EPA

Activity #3: Supply Curves

- Summarize current information (including forecasts)
    - ECAI Site
- Team to make recommendations on how centralize data and fill gaps

Participants:

- Paul Decotis, NYSERDA
- Ed Coe, EPA
- Burt English, University of Tennessee
- NREL
- EIA
- Maria Vargus, DOE–FE/NETL
- Denise Mulholland, EPA
- Mihsa Adamantiades, EPA
- Cary Bloyd, ANL

Appendix 5. Topic D: Improve Economic Impact Evaluation Tools and Methodologies

Participants:

Yaw Agyeman	Chris Hall (speaker)	Nora Lovrien
Ron Benioff	Rich Halvey	Rich Mignogna
Darrell Beschen	Karl Jessen (speaker)	Gail Mosey (facilitator)
Dwayne Breger	Michael Lahr (speaker)	Denise Mulholland
Paul DeCotis	Skip Laitner (speaker)	Eric Smith

Summary

This session's focus is on economic impact evaluation methodologies and tools that can be applied to a full range of energy efficiency and renewable energy technologies, projects, and policies.

Analytical Questions to Address:

- What are the tools?
- What is the methodology behind the tools?
- Where are these tools found?
- Who is using them?
- What are the gaps and limitations to these tools, the pros and cons of the tools?

Topic 1: Theory Behind Estimating and Analyzing Economic Impacts
Speaker 1: Dr. Michael Lahr, Associate Research Professor in the Center for Urban Policy Research at Rutgers University

Presentation covers:

- Differences between models from a theoretical perspective, including:
  - Input/output
  - Econometric
  - Time series
  - REMI
  - IMPLAN
- Address a key issue within modeling of adjusting for inter-regional trade.
- How a model may be more accurate in principal.
- Data issues confronted in modeling economic impact.
- Potential improvements and gaps in tools and methodologies.

Topic 2: Business Application of Economic Impact Evaluation
Speaker 2: Karl Jessen, Massachusetts Technology Collaborative (MTC)

Presentation covers:

- State level activity in economic impact evaluation
  - MA is performing an analysis of clean energy clusters in the state

- Clean energy companies were asked about company status, technologies, and challenges
- Discuss preliminary outcomes of the analysis

Topic 3: IMPLAN and REMI Considerations
Speaker 3: Chris Hall, New York State Energy Research and Development Authority (NYSERDA)

Presentation covers:

- NYSERDA has conducted an analysis using IMPLAN multipliers and is planning to replicate the analysis using REMI multipliers.
- Describe methodology used to model NYSERDA's programs using IMPLAN.

Topic 4: Status update and Ongoing Analysis in Economic Impact Evaluation since ECAI WS06
Speaker 4: Skip Laitner, American Council for an Energy Efficient Economy (ACEEE)

Presentation covers:

- Addresses and reports on analysis activities identified at ECAI WS06, including:
  - Model inventory and best practices and identify strengths/limitations
  - Full Accounting of Impacts
  - Define Appropriate Relationships of Economic Parameters in Models
- Potential collaboration
- Next steps

Group Discussion

Discussion is open to the group and featured speakers

- Q&A to address analysis questions and other areas of group interest
- Identify gaps, future analysis activities, and potential for collaboration

Synthesis and Wrap-up

Solutions identified in group discussion (and captured on storyboards) will be arranged and the group will lay out steps to take action and identify potential collaboration.

Panel Discussion:

A. Categories of benefits:
   - Energy bill savings
   - Money not spent on control technology
   - Health benefits
B. COBRA/EPA
   - Screening model
   - Input: air pollution reductions
   - Output: Air quality change to human health to dollars

- Capped areas have added issues

C. NYSERDA can claim jobs, reducing cost, but bump up against cap issues.
D. Efficiency scenarios with caps.
    - What is net benefit?
    - What is the effect on regulatory costs?
E. Heating Degree Days (HDD)
    - Ways to model bulk of poll happens here (hypothesis)
F. Modeling run of benefits:
    - NEBS (non–economic benefits)
    - Avoided regulatory and control costs
    - Energy savings
    - Health
    - Economic development
G. What works when making the sale with modeling results.
    - Decision is often already made
    - Model results validate/confirm policy decision
H. Some modeling effects help direct/choose policy types.

Needs/Gaps:

Focus on consequences of not developing technology:

1. ACEEE
    - Comparative diagnostics
    - National modeling conference 2008
    - Build and expand collaborative reach out to folks/analysts/modelers
2. Rutgers
    - Improve modeling energy trade, inter–regulatory trade flows
3. NYSERDA
    - Quantification of market transformation
    - Health benefits
    - Difference between two models (large model CGE–small model macro)
    - Quick capability focused on energy issues for states
    - Small manageable model for decision makers
    - Difference between IMPLAN and REMI
4. Massachusetts
    - Need data/information on EE including supplier relationships
    - Production functions of new technologies
    - Need it to be available (so many new ones that it's hard to keep up)
    - For converting agricultural biomass for transportation fuels and electricity need readily available data

Activities/Collaborators (When Identified):

1. Develop a website with fields including:
    - References

- Blog/wiki
- Production functions
    - Need support to develop and update
- Technology characterizations
    - Need support to develop and update
- Various types of data for economic impact analysis
- Reasonable dollar estimates
- How states work with other agencies
    - ACEEE did a meta-review, need meta-analysis

2. National modeling conference to address:
    - Comparative diagnostics feed in to reach out to other analysts
    - How do states work with other agencies
3. Small team (focus meeting) with decision makers who are setting the agenda.
    - Could be grass roots to start
    - Eventually funding needs to be behind it to sustain it
    - Fundamentals that need to be in place
    - Data requirements (production functions, technology characterization)
    - Maintain flexibility
    - Potential collaborators for team:
        - Ron Benioff
        - Cary Bloyd
        - Paul DeCotis
        - Mike Lahr
        - Skip Laitner
        - Gail Mosey
4. Develop a small, manageable model for decision makers:
    - Input: Size of community, EE Savings, other inputs?
    - Output: Economic impact

Appendix 6. Topic E: Risk and Uncertainty in Energy Modeling

Participants:

Doug Arent	Tom Fiddaman	Tom Secrest
Bill Babiuch	Scott Hassell	Walter Short
Sam Baldwin	Max Henrion	Linda Silverman
Darrell Beschen	Thomas Jenkin	Jeroen Struben
Dave Bjornstad	Dan Loughlin	Dave Vidaver
Karlynn Cory	John Maples	Carol White
Phil Dipietro	Lynn McLarty	

Summary

Speaker 1: Sam Baldwin, U.S. Department of Energy (DOE) – EERE

Presentation covers:

- Development of systems-based approaches to estimate the technical risk and uncertainty of R&D outputs
- Applying technical and market risk and uncertainty in program and technology benefits estimates

Speaker 2: Michael Leifman, U.S. Department of Energy (DOE) – EERE/PAE

Presentation covers:

- The SEDS model methodology and design
- DOE's current and planned applications of the SEDS model in decision making

Speaker 3: Dan Loughlin, U.S. Environmental Protection Agency (EPA)

Presentation covers:

- The use of Monte Carlo analysis in MARKAL modeling.

Speaker 4: Max Henrion, Lumina

Presentation covers:

- Applying risk and uncertainty into decision making.

Risk and Uncertainty Updates:

In this section, other professionals working in the area of Risk will provide brief (5-10 minute) updates on their work related to risk and uncertainty. Organizers will communicate this opportunity to participants (including states, regional groups, and other Federal agencies) in advance.

Panel and Group Discussion:

Questions:

- What are some major barriers to developing risk & uncertainty modeling or applying methodologies already in place?
- Are there actions (currently ongoing or that we could propose) that might help alleviate any of these barriers?

Synthesis and Wrap-Up

Main Question: What activities are you currently engaged in, and are there opportunities to collaborate in our efforts to include risk and uncertainty in energy modeling?

State Activities:

- Advancing risk and uncertainty probability assessments for systems
  - Relative up time of sites and economics
- Collaboration:
  - Report on deployment system design
- Power elements (load) economy optimization and its impact on back-up power

1. NREL
   - NREL has developed a SEDS model–they are coordinating with others (e.g. NETL, EIA) on its development and usability. There are some key issues/questions:
     - Covariance–how to deal with?
     - Right now takes a snapshot–how to model over time
   - Collaboration:.
     - How to deal with covariance and modeling over time
2. DOE R&D
   - Three different levels of dealing with risk and uncertainty:
     - Project
     - Portfolio
     - Program
   - Collaboration:
     - Case studies are currently available for geothermal and wind
     - Others are coming
3. DOE Government Performance Results Act (GPRA)
   - DOE is undertaking a basic way to incorporate risk into EERE technology evaluations
     - They call it “Risk–lite”
   - The plan is to take a comprehensive approach across all technologies in the future
   - This is being run by Michael Leifman
4. MIT
   - Performing research on alternative fuel vehicle transitions
     - Including technology and consumer behavior
     - First, they isolate key mechanisms
     - Then, identify how their part relates to other variables
5. California Energy Commission

- Monitoring and Evaluation of IOU EE goals
    - Quantify the performance of utility programs
    - CEC compares across the utilities
- Collaboration:
    - Other states can learn from CEC process

6. ORNL
    - Use conclusions from uncertainty policy analysis to bound downside (e.g. warranties)
    - Importance of omitted variable in market.
        - People form opinions, then act
    - Prototype–agent based model
        - How to gather data?
        - How do decision–makers make decisions?
    - Collaboration.
        - ORNL would like to work with others on prototype–agent based models

7. EIA
    - Working on uncertainty in demand side of energy models
        - Work being done with George Laey
    - Collaboration:
        - The report will be out soon
        - Steve Wade is also doing work on uncertainty in the demand side

8. FERC
    - FERC is preparing a state-of-demand response report for congress
    - Collaboration
        - FERC needs to quantify uncertainty of demand response, particularly elasticity
        - LBL is doing work here

9. EIA
    - In their NEMS model, there are a lot of variables that impact price
    - George Laey has done work here

10. DOE–Fossil Energy/NETL
    - FE has created a fuel cell spreadsheet tool that incorporates expert input.
        - Will iterate in next year.
        - Collaboration
            - Report upcoming
    - Partnering with NREL on SEDS model development
        - Outputs depend heavily on fossil fuel supply and price
    - Working on Integrated gas combined cycle (IGCC) cost and performance
        - Currently a small effort
        - Collaboration:
            - Is there interest to expand?
    - Was a 2001 effort
        - Needs updating

Other issues:

Errors in Models

- Energy models probably have more significant errors than other typical models

- In order to bound the errors, it is important to test with extreme condition tests
- Recognize that some energy issues are hard to make simple

Appendix 7. Topic F: Energy Model Data Session II: Renewable Energy and Petroleum

Participants :

Misha Adamantiades	Chris Namovicz	Walter Short
Cyrus Behedewar	Phil Patterson	Elaine Sison-Lebrilla
Sujit Das	Jeff Pillon	Eric Smith
Ken Koyama	Dan Santini	
Brian Levite	David Shen	

Summary

This session will involve discussions of areas of energy modeling where access to data is a currently a limiting factor. Each presentation will be followed by a facilitated discussion of challenges and potential avenues for improvement.

Topic 1: Modeling Data Issues in the Area of Renewable Energy
Speaker 1: Walter Short, National Renewable Energy Laboratory (NREL)

Presentation covers:

- Technology characterization data resources and limitations.
- Questions:
    - What are data issues/shortcomings faced by modelers?
    - What data sources exist that might address these issues?
    - What can/should be done to address the unmet needs identified?

Topic 2: Group Discussion of Modeling Data Issues in the Area of Petroleum
Speaker 2: Jeff Pillon, Michigan Energy Office

Presentation covers:

- Petroleum data
- Methods for analysis of short term supply, demand, and prices.
- Questions:
    - What are data issues/shortcomings faced by modelers?
    - What data sources exist that might address these issues?
    - What can/should be done to address the unmet needs identified?

Synthesis and Wrap-Up

Renewable Energy

1. Data resource issues
    - Renewable resource data.
    - Understanding the variability of renewable resources.
    - Can we get data on "what didn't happen"?

- Materials and labor costs are rising.
    - COE estimates are rapidly out of date.
- Fuel prices.
- Technology characterization.
- Different kinds of data:
    - Electric utility
    - Consumer choice
    - Electric transmission
    - Buildings
    - Transportation
- Uncertainty

2. Using the information
    - "Renewables" is a broad category with too many technologies.
    - Resources and ability to evaluate RE resources vary considerably by state.
    - "Advocacy" can be the enemy of reliable data and analysis.
    - Actual usage data is often proprietary.
    - There is a disconnect between modelers and programs funding RE projects.
    - Most government support is driven by tax incentives.
        - This is a bad mechanism to leverage for data
3. Gaps and shortcomings
    - Too few data points makes aggregation difficult.
4. Application issues
    - CEC just completed a levelized cost of energy for RE.
    - Utilities could aggregate data and provide publicly.
    - NREL wind resources report just released.
    - CEC is tracking installed costs of solar panels.
    - Programs should build reporting requirements into all financial support
        - I.e., grants and contracts
    - Demonstrating the value of good analysis to those who control the data.
5. Potential Solutions
    - Create an inventory of the kinds of data needed.
    - Create an inventory of the data available in each state.
    - Go through industry groups.
6. Actions
    - Working group
        - Create data needs inventory.
        - Communicate to key organizations.
        - Engage with ACORE to present the value of providing this data to industry players.

Fossil Fuels

1. Data resource issues
    - State refineries are not required to report to the government in all states.
    - States cannot require reporting from out of state refineries.
    - Data collection is very expensive.

- EIA has not had a sufficient budget to collect and track this data.

2. Using the information
    - Markets can be severely affected by poor data or interpretation.
    - Traders of fuel futures are reaction to faulty data.
    - Timeliness–Making policy decisions based on out-of-date data
    - Timeliness–Prevents proper modeling of price elasticity
3. Gaps and shortcomings
    - E85 is not being tracking all areas
    - Infrastructure data is largely missing in government data agenda
    - National security is increasing the profile of infrastructure evaluation
4. Application issues
    - Long term forecasts
        - Lack of clarity on their role
    - Not enough attention is given to presenting this data
    - Data inundation
        - So much data on the internet, it is hard to filter out the noise
5. Potential Solutions
    - Examine EIA versus API data to determine if there is good correlation
    - Make people more aware of uncertainty in fuel estimates
    - Other states could require refinery data reporting
    - Determine data elements that take longest to determining
        - Convey priorities to EIA
    - Increase EIA's budget to collect and track data.
    - EIA could track individual events and their impact on fuel supply.
    - Oil delivery infrastructure data needs to be improved.
6. Actions
    - EIA should show weekly survey data versus monthly census data
        - In weekly survey
    - Ethanol data collection working group to discuss: EIA plans, State practices, legislative needs, Industry data resources
    - NASEO will coordinate with EIA
    - Government (DOE/DOT) should increase its focus on fuel delivery infrastructure
    - Post state analysis data on central ECAI web site

Activities:

Activity #1: Create a renewable energy data needs inventory and engage ACORE and Agencies

Participants:

- Dwayne Breger, MA DOER
- Steve Smith, PNNL
- Chris Namovicz, EIA

Activity #2: Explore concept of a Collaborative for University research on energy data

Participants:

- Phil Patterson, DOE–EERE
- Cyrus Bhedwar, GA EFA
- Dan Santini, ANL
- Mike Lahr, Rutgers

Activity #3: Create an inventory of Energy modeling data sources

Participants:

- None

Activity #4: Identify current transmission data reporting requirements and make recommendations on addressing gaps

Participants:

- None

Activity #5: Fossil Fuel Data collection

- Determine EIA plans
- State practices
- Legislative needs
- Industry data resources

Participants:

- None

Appendix 8. Closing Discussion: Activities and Topics for Future Collaboration

What Topics and Activities?

1. Process for ECAI to provide direct input into the federal analysis agenda at federal agencies
    - Multi-year planning
    - AOPS
    - *Capability building–ID needs
2. Focused planning for research on selected topics where increased investment is needed
3. Smart approach to energy modeling
4. Centralized Energy Analysis Web site
    - No where to go to get funding
5. Capture areas of expertise:
    - M&E hit rate
    - Web-based versions of results
6. Diagnostics Repetto Austin
    - Light: Static review of model outcomes to include things missing
        - Change result
    - Heavy: Funding to develop easy to use plug-n-play algorithms
7. Data:
    - Technology characterizations are out of date
        - Critical for emerging tech
        - Mechanism to gather and assess
    - Get data out
        - Make accessible
8. Develop a process for unbiased peer review—include QA/QC when analysis is developed, in order to share data sources, and when conclusions are formed. Use ECAI as a forum to discuss all these types of analysis across:
    - State agencies,
    - Federal agencies,
    - Academics, and
    - International

I. Partner with ACORE through join outlook process
    - They have data earlier
    - From industry

J. Translation guide/documentation
    - Assumptions
    - Limitations

K. Future trends, future tech development rather than generic backstop

How to Effectively Collaborate?

1. Data
2. Conduct Analysis

Story to communicate results (not just about numbers)

How to Broaden Participation in ECAI

1. Dialogue with OMB, congressional staff
2. Identify congressional priority topics
    - Work w/ EESI on Briefings
3. Identify interests of large energy users
4. AUBER

How can we effectively communicate to decision makers?

1. Animation
2. Use principles and examples as explained by Edward Tufte in Envisioning Information.
    - The book provides practical advice about how to explain complex material by visual means, with extraordinary examples to illustrate the fundamental principles of information displays.
    - It shows maps, charts, scientific presentations, diagrams, computer interfaces, statistical graphics and tables, stereo photographs, guidebooks, courtroom exhibits, timetables, use of color, a pop-up, and many other wonderful displays of information.
3. Understand your decision-maker and how he/she processes information then pick the approach.
4. Forum to share examples and needs
5. Forums on ECAI website/Blog
    - Organize as a Wiki
    - Side bar for comments
6. Listserv for topics
7. Manon Vendenbelt –Mediated Modeling book
    - To focus on most important variables
    - In absence of data, get insight–pseudo data
8. Tell them what they want to know (outputs), not what you think they need to know

Appendix 9. Participant List

Doug Arent
NREL/National Renewable Energy Laboratory

Misha Adamantiades
EPA/Environmental Protection Agency

Yaw O. Agyeman
TMS/Technology & Management Services, Inc.

Bill Babiuch
DOE/TMS

Sam Baldwin
DOE/EERE

Ron Benioff
NREL/National Renewable Energy Laboratory

Darrell Beschen
DOE/EERE/PAE

Cyrus Bhedwar
Georgia Environmental Facilities Authority

Dave Bjornstad
ORNL/Oak Ridge National Laboratory

Cary Bloyd
ANL/Argonne National Laboratory

Dwayne Breger
MA DOER/Massachusetts Division of

Brian Card
DOE/EERE/PAE

Ed Coe
EPA/OTAQ

Karlynn Cory
NREL/National Renewable Energy Laboratory

Sujit Das
ORNL/Oak Ridge National Laboratory

Paul A. DeCotis
NYSERDA

Ronald Diehl
DOE/Army

Phil Dipietro
NETL/National Energy Technology Laboratory

Michael T. Echart
ACORE/American Council on Renewable

Karen Ehrhardt-Martinez
American Council for an Energy-Efficient Economy (ACEEE)

Burton English
University of Tennessee

Kulvinder (Kohl) Gill
DOE/OS

Chris Hall
NYSERDA

Rich Halvey
Western Governors Association

Scott Hassell
DOE/EERE/PAE

Max Henrion
Lumina Decision Systems

Susan Holte
DOE/EIA

Thomas Jenkin
NREL/National Renewable Energy Laboratory

Karl Jessen
Massachusetts Technology Collaborative

Gary Kleiman
NESCAUM/NESCCAF

Ken Koyama
CEC/California Energy Commission

Michael L. Lahr
Rutgers University

Skip Laitner
ACEEE/American Council for an Energy-Efficient

Michael Leifman
DOE/EERE/PAE

Brian Levite
NREL/National Renewable Energy Laboratory

Dan Loughlin
EPA/Environmental Protection Agency

Nora Lovrien
Rutgers, the State University of New Jersey

John Maples
DOE/EIA

Lynn McLarty
DOE/TMS

Richard Mignogna
Colorado PUC

Gail Mosey
NREL/National Renewable Energy Laboratory

Denise Mulholland
EPA/Environmental Protection Agency

Chris Namovicz
DOE/EIA

Michelle New
NASEO

Philip Patterson
DOE/EERE/PAE

Jeff Pillon
MI PSC (NASEO)

Dan Santini
ANL/Argonne National Laboratory

Tom Secrest
PNNL/Pacific Northwest National Laboratory

David C. Shen
Technology & Management Services, Inc.

Walter Short
NREL/National Renewable Energy Laboratory

Linda Silverman
DOE/EERE/Wind

Elaine Sison-Lebrilla
SMUD/Sacramento Municipal

Eric Smith
EPA/Environmental Protection Agency

Jeroen Struben
University/MIT Energy Lab

Bill Valdez
DOE/OS

Uday Varadarajan
DOE/OS

Maria Vargas
DOE/FE/NETL

Dave Vidaver
CEC/California Energy Commission

Carol White
FERC

Carl Wilkins
ASERTTII

Appendix 10. Acronyms and Abbreviations

ACEEE	American Council for an Energy Efficient Economy
ACORE	American Council of Renewable Energy
ANL	Argonne National Laboratory
AOPS	Annual Operating Plans
API	American Petroleum Institute
AUBER	Association of University Business and Economic Research
BAU	Business as usual
CAO	
CEC	California Energy Commission
CGE	
COE	Cost of energy
DOE	U.S. Department of Energy
DOE-EERE	U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy
DOE-EIA	U.S. Department of Energy's Energy Information Administration
DOE-FE	U.S. Department of Energy's Fossil Energy Office
DOE-Science	U.S. Department of Energy's Office of Science
DOT	U.S. Department of Transportation
ECAI	Energy Collaborative Analysis Initiative
EE	Energy efficiency
EIA	Energy Information Administration; an Office of the U.S. Department of Energy
EO	Energy Office (usually a state energy office)
EPA	U.S. Environmental Protection Agency

FERC	Federal Energy Regulatory Commission
GA EFA	Georgia Environmental Facilities Authority (the state energy office of Georgia)
GPRA	Government Performance and Results Act; enacted in 1993 to focus federal government programs on the results of activities undertaken. Under the Act, agencies are to develop multiyear strategic plans, annual performance plans, and annual performance reports.
HDD	Heating Degree Days
HUD	Housing Urban Development
IAMs	Integrated Assessment Models
ID	Identify
IGCC	Integrated gas combined cycle
IMPLAN	An economic impact modeling system for states, counties or multi-county regions.
IOU EE	Investor-owned utility energy efficiency (usually a program)
ISO	Independent System Operator
IWG	Interlaboratory Working Group – This is a DOE Working Group consisting of the five national energy research labs.
M&E	Monitoring and evaluation
MA	Massachusetts
MA DOER	Massachusetts Division of Energy Resources (the state's energy office)
MARKAL	A long-term optimization model that includes a variety of energy technologies and allows for evaluation of alternative technology and policy options, developed by the International Energy Agency's Energy Technology System Analysis Program
MIT	Massachusetts Institute of Technology
MTC	Massachusetts Technology Collaborative
NASEO	National Association of State Energy Officials

NEBS	Non–Economic Benefits
NEMS	National Energy Modeling System, a large energy model developed and operated by DOE-EIA.
NETL	The National Energy Technology Laboratory, a federal laboratory of the Department of Energy
NESCAUM	Northeast States for Coordinated Air Use Management
NREL	The National Renewable Energy Laboratory, a federal laboratory of the U.S. Department of Energy
NSF	National Science Foundation
NYSERDA	New York State Energy Research and Development Authority; an agency that performs basic energy research and analysis on a variety of energy issues.
OMB	U.S. Office of Management and Budget
ORNL	Oak Ridge National Laboratory
OSTP	Office of Science and Technology Policy
PNNL	Pacific Northwest National Laboratory
QA/QC	Quality assurance/quality control
R&D	Research and development
RE	Renewable energy
RE/EE	Renewable energy and/or energy efficiency
REMAP	Renewable Energy Modeling and Analysis Partnership
RPS	Renewable Portfolio Standards
RTO	Regional Transmission Organization
SEDS	Stochastic Energy Deployment System. This is capacity-expansion model of the U.S. energy market, developed and maintained by NREL.
TTC	